DESCRIPTION

TAXIS ANALYSIS METHOD, CANCER EVALUATION METHOD, TAXIS ANALYSIS SYSTEM AND PROGRAM

Technical Field

[0001]

The present invention relates to a taxis analysis method, a cancer evaluation method, a taxis analysis system and a program.

Background Art

[0002]

In the related art, a cancer detection method using taxis of nematodes that exhibit attraction behavior with respect to urine of a cancer patient is known (see, for example, Non Patent Literature 1.).

Citation List

Non Patent Literature

[0003]

Non-Patent Literature 1: Hirotsu T. et al., PLOS ONE, 1 0 (3): e 0118699, 2015

Summary of Invention

[0003a] In one aspect, the disclosure provides a taxis analysis method for performing taxis analysis of nematodes

using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis method comprising steps of: imaging a distribution mode of the nematodes in the container; determining an attraction region and/or a avoidance region based on the reference point; and executing taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

[0003b] In another aspect, the disclosure provides a taxis analysis method for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis method comprising steps of: positioning the reference point and an imaging device in a predetermined positional relationship; imaging a distribution mode of the nematodes in the container by the imaging device; determining an attraction region and/or a avoidance region; and executing taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

[0003c] In another aspect, the disclosure provides a cancer evaluation method comprising: the taxis analysis method according to the disclosure; and a step of evaluating a possibility of cancer in the subject using the taxis

analysis result obtained by executing the taxis analysis.

[0003d] In another aspect, the disclosure provides a taxis analysis system for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis system comprising: a control unit configured to control an imaging unit to image a distribution mode of the nematodes in the container; and an analysis unit configured to detect a position of an object of the reference point included in an image obtained by the imaging and corresponding to the reference point, determine an attraction region and/or a avoidance region based on the position, and execute taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

[0003e] In another aspect, the disclosure provides a program for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the program causing a computer to be executed as: an analysis unit configured to detect a position of an object of the reference point corresponding to the reference point included in an image obtained by imaging a distribution

mode of the nematodes in the container, determine an attraction region and/or a avoidance region on a basis of the position, and execute taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

[0003f] In another aspect, the disclosure provides a taxis analysis method for performing taxis analysis of nematodes, the taxis analysis method comprising steps of: imaging a distribution mode of nematodes in the container; and executing taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region.

[0003g] In another aspect, the disclosure provides a cancer evaluation method comprising: the taxis analysis method according to the disclosure; and a step of evaluating a possibility of cancer in the subject by using a taxis analysis result obtained by executing the taxis analysis.

[0003h] In another aspect, the disclosure provides a taxis analysis system for performing taxis analysis of nematodes, the taxis analysis system comprising: a control unit configured to control an imaging unit to image a distribution mode of nematodes in a container after the

nematodes and a specimen of a subject are dropped into the container; and an analysis unit configured to execute taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region.

[0003i] In another aspect, the disclosure provides a program for performing taxis analysis of nematodes, the program causing a computer to be executed as: an analysis unit configured to execute taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region included in an image obtained by imaging a distribution mode of nematodes in a container after the nematodes and a specimen of a subject are dropped into the container.

Technical Problem

[0004]

CLAIMS

1. A taxis analysis method for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis method comprising steps of:

imaging a distribution mode of the nematodes in the container;

determining an attraction region and/or a avoidance region based on the reference point; and

executing taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

2. The taxis analysis method according to claim 1,

wherein in the step of executing the taxis analysis, the nematodes in the determined attraction region are counted and/or the nematodes in the determined avoidance region are counted, and a taxis analysis result is output according to a count result.

3. The taxis analysis method according to claim 1 or 2,

wherein the reference point is a code including container identification information for identifying the container,

an image obtained in the step of imaging includes a code object corresponding to the code, and

the taxis analysis method further comprises steps of:

reading the container identification information from

the code object; and

storing in a storage a taxis analysis result that is a result of executing the taxis analysis in association with the read container identification information.

4. The taxis analysis method according to claim 3,

wherein subject identification information for identifying a subject and container identification information are stored in the storage in association with each other, and

the taxis analysis method further comprises a step of:

identifying subject identification information corresponding to the container identification information read from the code object with reference to the storage.

5. The taxis analysis method according to claim 1 or 2,

wherein the reference point includes a first reference point and/or a second reference point.

6. The taxis analysis method according to any one of claims 1 to 5, further comprising a step of:

removing a lid of the container before imaging inside of the container.

7. The taxis analysis method according to any one of claims 1 to 6,

wherein in the step of determining the attraction region and/or the avoidance region, an angle of a straight line passing through a position of the reference point and

a center of the container with respect to a reference line is determined, and a reference format in which the attraction region and/or the avoidance region is set in advance is rotated by the angle to determine the attraction region and/or the avoidance region.

8. The taxis analysis method according to any one of claims 1 to 6,

wherein in the step of determining the attraction region and/or the avoidance region, an angle of a straight line passing through a position of the reference point and a center of the container with respect to a reference line is determined, and an image obtained by the imaging is rotated by the angle to determine the attraction region and/or the avoidance region in the rotated image.

9. A taxis analysis method for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis method comprising steps of:

positioning the reference point and an imaging device in a predetermined positional relationship;

imaging a distribution mode of the nematodes in the container by the imaging device;

determining an attraction region and/or a avoidance region; and

executing taxis analysis using objects of nematodes in

the determined attraction region and/or avoidance region.

10. The taxis analysis method according to any one of claims 1 to 6,

wherein in the step of determining the attraction region and/or the avoidance region, an angle of a straight line passing through a position of the reference point and a center of the container with respect to a reference line is determined, the container is rotated by the angle, a distribution mode of the nematodes in the container after the rotation is imaged, and the attraction region and/or the avoidance region is determined by comparing an image obtained by the imaging with a reference format in which the attraction region and/or the avoidance region is set in advance.

11. A cancer evaluation method comprising:

the taxis analysis method according to any one of claims 1 to 10; and

a step of evaluating a possibility of cancer in the subject using the taxis analysis result obtained by executing the taxis analysis.

12. A taxis analysis system for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the taxis analysis system comprising:

a control unit configured to control an imaging unit to

image a distribution mode of the nematodes in the container; and

an analysis unit configured to detect a position of an object of the reference point included in an image obtained by the imaging and corresponding to the reference point, determine an attraction region and/or a avoidance region based on the position, and execute taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

13. A program for performing taxis analysis of nematodes using a container in which a reference point is provided in the container or a culture medium in the container, the program causing a computer to be executed as:

an analysis unit configured to detect a position of an object of the reference point corresponding to the reference point included in an image obtained by imaging a distribution mode of the nematodes in the container, determine an attraction region and/or a avoidance region on a basis of the position, and execute taxis analysis using objects of nematodes in the determined attraction region and/or avoidance region.

14. A taxis analysis method for performing taxis analysis of nematodes, the taxis analysis method comprising steps of:

imaging a distribution mode of nematodes in the

container; and

executing taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region.

15. A cancer evaluation method comprising:

the taxis analysis method according to claim 14; and

a step of evaluating a possibility of cancer in the subject by using a taxis analysis result obtained by executing the taxis analysis.

16. A taxis analysis system for performing taxis analysis of nematodes, the taxis analysis system comprising:

a control unit configured to control an imaging unit to image a distribution mode of nematodes in a container after the nematodes and a specimen of a subject are dropped into the container; and

an analysis unit configured to execute taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region.

17. A program for performing taxis analysis of nematodes, the program causing a computer to be executed as:

an analysis unit configured to execute taxis analysis using an area value of a region occupied by objects of nematodes in an attraction region and/or a avoidance region included in an image obtained by imaging a distribution

mode of nematodes in a container after the nematodes and a specimen of a subject are dropped into the container.